SID 65-1673-1

RF RADIATED SUSCEPTIBILITY RETEST OF APOLLO C14-354 PYROTECHNIC INTIATOR CHECKOUT BRIDGE SET MODEL PTS6566, S/N 01-001 ATR 481041

20 January 1966

Approved by

D K Bailey

D. K. Bailey, Director
Engineering Development Laboratory

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

TECHNICAL REPORT INDEX/ABSTRACT

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AUTHOR(S)

HOLSBORG, W.

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DESCRIPTIVE TERMS

APOLLO PROJECT, *QUALIFICATION TESTING ELECTROMAGNETIC INTERFERENCE /EMI/ TEST, *PYROTECHNIC INITIATOR CHECKOUT BRIDGE SET, MODEL PTS 6566.

ABSTRACT

A RADIO FREQUENCY RADIATED SUSCEPTIBILITY TEST WAS REPEATED ON THE C14-354 PYROTECHNIC INITIATOR BRIDGE SET, MODEL PTS 6566, PART NUMBER G16-821050, SERIAL NUMBER 01-001, TO SATISFY THE REQUIREMENTS OF QLR 2607, REVISION A. THE TEST WAS PERFORMED TO VERIFY THAT THE TEST SPECIMEN, WHEN MODIFIED AS RECOMMENDED IN SID 65-1673, WOULD COMPLY WITH THE APPLICABLE REQUIREMENTS OF MIL-I-26600/MSC-ASPO-EMI-10A.

WITH THE BRIDGE SET OUTPUT CABLES AND THE SIX DUMMY SQUIBS COMPLETELY SHIELDED, THE TEST SPECIMEN WAS EXPOSED TO THE REQUIRED 100,000-MICROVOLT RADIO FREQUENCY FIELD COVERING THE FREQUENCY RANGE OF 150 KC to 1000 MC. WHILE THE APPROPRIATE SIGNAL GENERATOR WAS SLOWLY SWEPT THROUGH THE TEST FREQUENCY RANGE, THE INDICATOR METERS ON THE BRIDGE SET WERE MONITORED FOR AN ANOMALOUS OPERATION. NO MALFUNCTION OR DEGRADATION OF PERFORMANCE WAS OBSERVED THROUGHOUT THE TEST.

FOREWORD

This report has been prepared by the S&ID Engineering Development Laboratory, Electronics Systems Test Group, for the Apollo Design GSE Group under ATR 481041. This document is submitted to Department 692-601 to verify that the C14-354 Pyrotechnic Initiator Bridge Set, model number PTS 6566, part number G16-821050, serial number 01-001 conforms to the RF Radiated Susceptibility requirements of MIL-I-26600/MSC-ASPO-EMI-10A when modified as recommended in SID 65-1673.

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ILLUSTRATIONS

INTRODUCTION

The C14-354 Pyrotechnic Initiator Bridge Set was modified to improve the shielding of the six dummy squibs and two output cables that connected the ME403-0006-0001 bridge set to the dummy squibs. An RF radiated susceptibility test was performed on the modified system as prescribed by QLR 2607, Revision A, and MIL-I-26600/MSC-ASPO-EMI-10A. No malfunction or degradation of performance was observed when the test specimen was exposed to the RF field prescribed by MIL-I-26600/MSC-ASPO-EMI-10A.

TEST SUMMARY

TEST SETUP

The ME403-0006-0001 bridge set, six dummy squibs, and the two interconnecting cables were set up within a shielded enclosure, 16 by 20 by 8 feet, located in the Central Instrumentation Facility (CIF) Building, at Kennedy Space Center, Florida. (See Figure 1.)

ELECTRICAL BONDING AND GROUNDING

The bridge set was bonded to the copper ground plane with a copper bonding strap having minimum width-to-length ratio of 1:5. Each dummy squib was bonded to the copper ground plane.

TEST SAMPLE LEADS

The two operational cables that connected the bridge set to the dummy squibs were utilized during the test and had been modified to improve the shielding effectiveness.

TEST INSTRUMENTATION OPERATION

The signal generators and required antennas employed during the susceptibility test were operated in accordance with the manufacturers' recommendations. When utilizing the 41-inch rod antenna as the radiating element, the antenna counterpoise was bonded to the copper ground plane through a copper ground strap that was as wide as the counterpoise. When the tuned dipole antennas were used, the antenna and signal generator were grounded through the third conductor (ground) in the power plug.

ANTENNA ORIENTATION

When the 41-inch rod antenna was used, the antenna counterpoise was placed 6 inches below the level of the copper ground plane. The rod antenna was in a vertical position, 1 foot from the test specimen, and positioned for maximum leakage. When the tuned dipole antennas were used, the dipole was parallel to the horizontal axis of the test specimen, 1 foot above the level of the ground plane and 1 foot from the test specimen. The center of the dipole was positioned opposite the geometric center of the test specimen.

TEST SPECIMEN DESCRIPTION

For this test, the C14-354 Pyrotechnic Initiator Checkout Bridge Set consisted of the Pyrotechnic Initiator Checkout Bridge, Part ME403-0006-0001, the six dummy squibs, part G16-821062, and the two interconnecting cables (J1 and J2). * The test specimen was powered by self-contained dry cell batteries and was operated in the LOCAL position.

FUNCTIONAL CHECKOUT

Prior to the RF radiated susceptibility test, the test specimen was functionally checked and was determined to be in normal operating condition.

*Note: Change from test setup outlined in SID 65-1673 authorized by NAA EMC Unit, D/692-601.

TEST EQUIPMENT

The following NASA test equipment was used during the RF radiated susceptibility test and was operated in accordance with the manufacturers' recommendations and displayed a NASA calibration sticker:

Nomenclature	Manufacturer	Serial Number
41-inch rod antenna	Empire Devices	---
Tuned dipole antenna, DM-105-T1	Empire Devices	---
Tuned dipole antenna, DM-105-T2	Empire Devices	---
Tuned dipole antenna, DM-105-T3	Empire Devices	---
Signal generator, 606A	Hewlett-Packard	301-04584
Signal generator, 608C	Hewlett-Packard	274-04929
Signal generator, C12A	Hewlett-Packard	NASA 35112

TEST PROCEDURE

The RF radiated susceptibility test was performed over a frequency range of 150 kc to 1000 mc in accordance with MIL-I-26600/MSC-ASPO-EMI-10A and QLR 2607, Revision A.

The test specimen was subjected to an RF field established by a 50-ohm signal generator driving an appropriate test antenna with a 100,000-microvolt (calculated) output modulated 30 percent at 400 cps. The 41-inch rod antenna, connected to the appropriate signal generator, was used for the test covering the frequency range of 150 kc to 25 mc. Over the frequency range of 25 mc to 1000 mc, a tuned dipole antenna was used as the radiating source.

With the antenna placed 1 foot from the test specimen, the appropriate signal generator was slowly tuned throughout the test frequency range, and the indicator meters on the bridge set were monitored for a deflection, which would constitute an anomalous operation of the test specimen.

TEST RESULTS

No malfunction or degradation of performance was observed when the test specimen was subjected to the required RF field.

CONCLUSION

With the shielding fixes installed on the dummy squibs and bridge set output cables (J1 and J2), the C14-354 Pyrotechnic Initiator Checkout Bridge Set met the RF radiated susceptibility requirements of MIL-I-26600/MSC-ASPO-EMI-10A.

REFERENCES

1. MIL-I-26600/MSC-ASPO-EMI-10A, Interference Control Requirements, Aeronautical Equipment (17 October 1963).

2. MA0203-3544, Ground Support Equipment, Model C14-354, Electromagnetic Interference Test, Procedure for (4 October 1965).

3. QLR 2607, Revision A, Electromagnetic Interference Qualification Test Plan for Pyrotechnic Initiator Checkout Bridge Set, Model C14-354, Part G16-821050.

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION
12214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA

ELECTROMAGNETIC COMPATIBILITY DATA SHEET

TEST TITLE: RF Radiated Susceptibility Retest of APOLLO C14-354 Bridge Set	DEPT. 098	TEST REPORT NO. SID 65-1673-1
TEST SPECIMEN: C14-354 Pyrotechnic Initiator Check-out Bridge Set	UNIT RF	LR NO.: 2607 SWA NO.:
	DATE: 7 January 1966	
TEST PERFORMED BY: RESP. ENG.: W. Holsborg TECH.:	WITNESSED BY: T. L. Day NAA QC	TYPE OF EMI TEST: RF Radiated Susceptibility

Frequency (mc)	Radiated Level (Micro-volts)							
0.150 ↑ 25.0 26.0 ↓ 35.0 ↓ 1000	100K ↓ 1000K	41-in. rod antenna ↓ Tuned dipole adjusted to 35 mc ↑ Tuned dipole adjusted to test frequency ↓	No change in test specimen was observed throughout the entire test frequency range. ↓					

REMARKS: Radiated level reflects the output of the 50-ohm signal generator calculated to exist across the antenna terminals

FORM 2928-J NEW 2-65

Figure 1. Radiated RF Susceptibility Test Setup Utilizing 41-Inch Rod Antenna (Position 1)

Figure 2. Radiated RF Susceptibility Test Setup Utilizing 41-Inch Rod Antenna (Position 2)

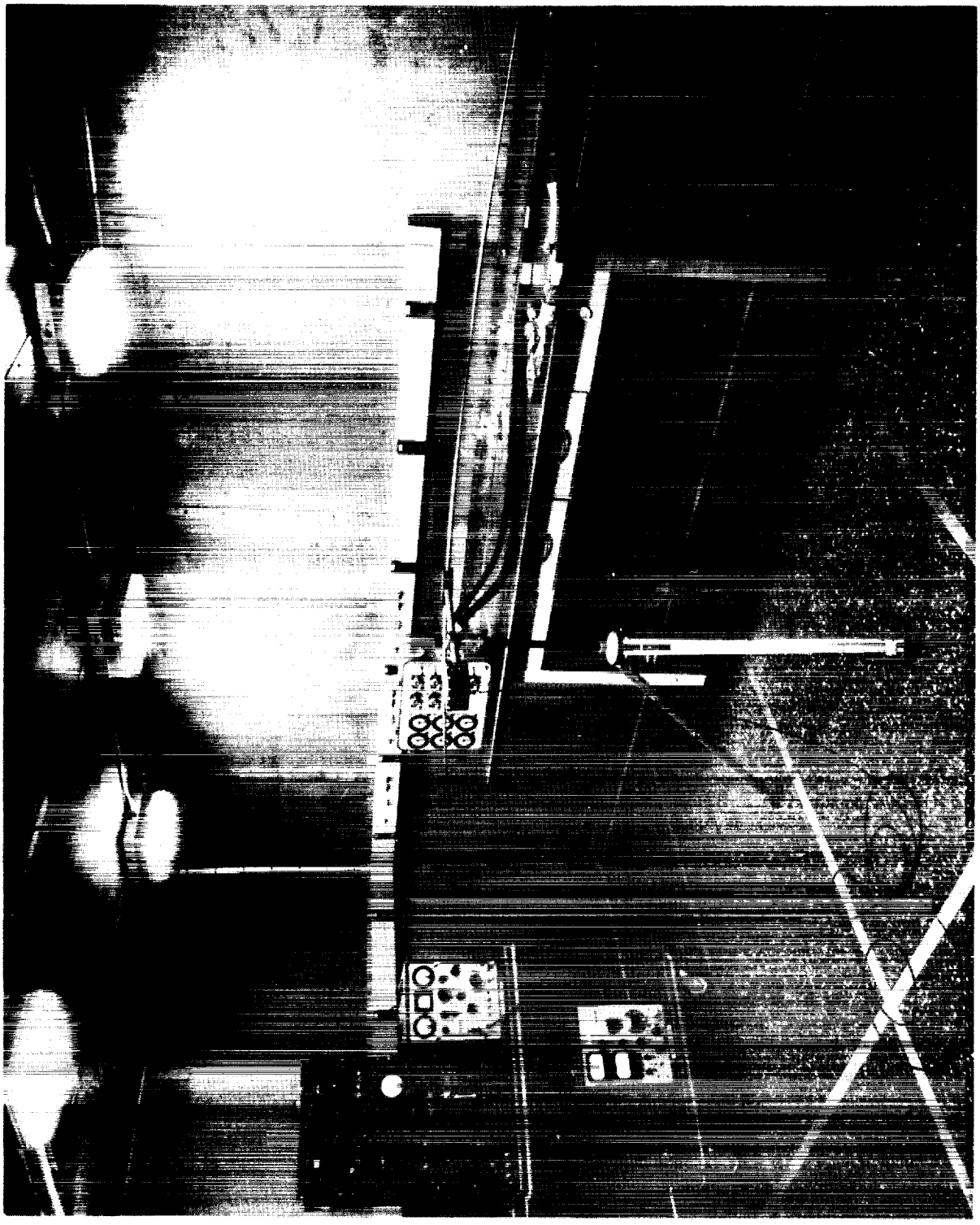

Figure 3. Radiated RF Susceptibility Test Setup Utilizing Tuned Dipole Antenna

APPENDIX A

DATA SHEET

APPENDIX B

RADIATED RF SUSCEPTIBILITY TEST SETUP